

- Bitwise Operators
- Assignment Operators
- Math functions
- String functions
- Doubles

### 3. Bitwise XOR. (^)

<u>OR.</u>		
0	0	0
0	1	1
1	0	1
1	1	1

### XOR.

I/p 1	I/p 2	O/p.
0	0	0
0	1	1
1	0	1
1	1	0

XOR: { some bits : 0  
                  { different bits : 1

$$0 \% 2 = 0$$

$$\text{if } (\text{bit1} + \text{bit2}) \% 2$$

$$0 \% 2 = 1$$

$$1 \% 2 = 1$$

$$\begin{array}{r}
 0 \quad 1 \\
 | \quad | \\
 1 \quad 0 \\
 | \quad | \\
 1 \quad 1
 \end{array}
 \begin{array}{l}
 1 / 10 \times -1 \\
 1 \% 2 = 1 \\
 2 \% 2 = 0
 \end{array}$$

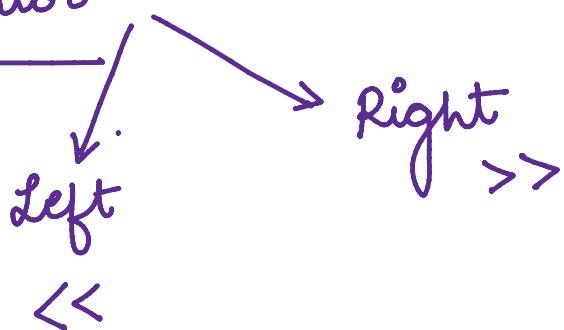
$5 \wedge 7$

$$\begin{array}{r}
 1 \ 0 \ 1 \\
 1 \ 1 \ 1 \\
 \hline
 0 \ 1 \ 0
 \end{array}
 \rightarrow 2$$

$11 \wedge 23$

$$\begin{array}{r}
 0 \ 1 \ 0 \ 1 \ 1 \\
 1 \ 0 \ 1 \ 1 \ 1 \\
 \hline
 1 \ 1 \ 1 \ 0 \ 0
 \end{array}
 \rightarrow \underline{28}$$

4. Shift Operator



left shift :

$$\frac{N=5}{N \ll 1}$$

$$N \ll 1$$

$$\begin{array}{r}
 1 \ 0 \ 1 \\
 1 \ 0 \ 1 \\
 \hline
 0
 \end{array}
 = 1010 \Rightarrow 10$$

$$1010 \Rightarrow 10$$

$N \ll 1$  $1010 \Rightarrow 10$  $N \ll 2$ 

$$\begin{array}{r} 1 0 1 0 0 \\ 2^4 2^3 2^2 2^1 2^0 \end{array}$$

$10100 \rightarrow 20$

$$\begin{array}{r} 1 0 1 \\ - 0 1 = \\ 0 \end{array}$$

$$\underline{1 * 2^4 + 1 * 2^2} = 16 + 4 = 20$$

 $\underline{N=6}$  $N \ll 1$  $N \ll 2$  $N \ll 3$ 

$$\begin{array}{r} 1 1 0 \\ - 1 1 0 \\ \hline - 0 0 0 \end{array}$$

 $\rightarrow 12$  $6 \times 2$  $\rightarrow 24$  $6 \times 2 \times 2$  $\rightarrow 48$  $6 \times 2 \times 2 \times 2$  $\underline{N=9}$ 

$$\begin{array}{r} 1 0 0 1 \\ - 1 0 0 1 \\ \hline 0 \end{array}$$

$1001 \underline{1} = 18$

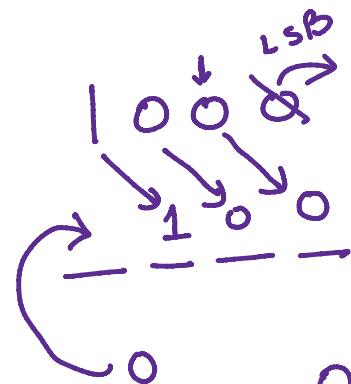
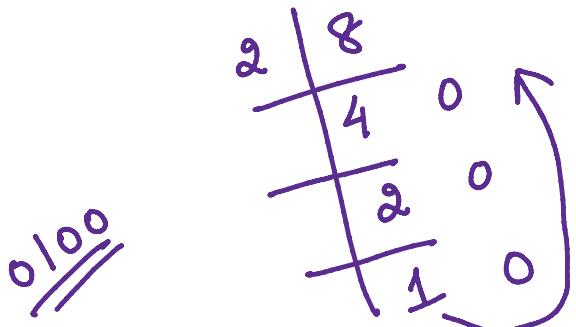
$1001 \underline{0} \underline{0} = 36$

 $N \ll 2$  $N \ll R$  $N * 2 * 2 * \dots * 2$  $\swarrow k \text{ times}$  $\boxed{N \ll R \Rightarrow N * 2^k}$

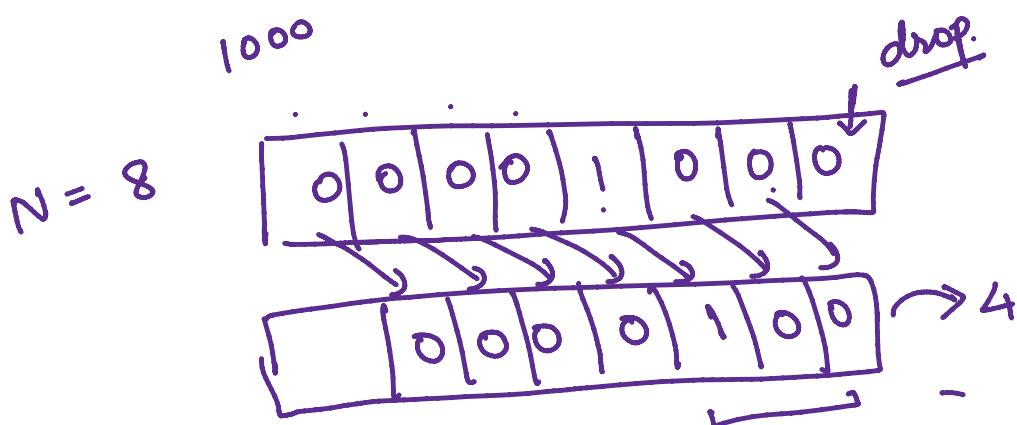
$N \ll R = 1$

Right Shift

$$\underline{N = 8}$$



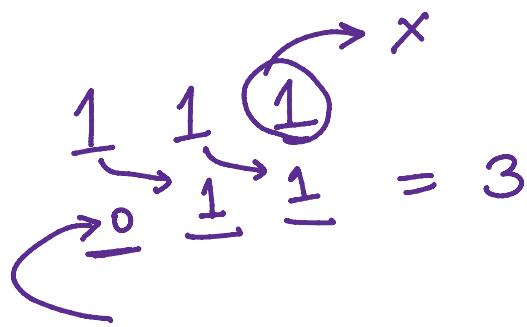
$$0100 \Rightarrow 4$$



$N = 7$        $7 >> 1 :$

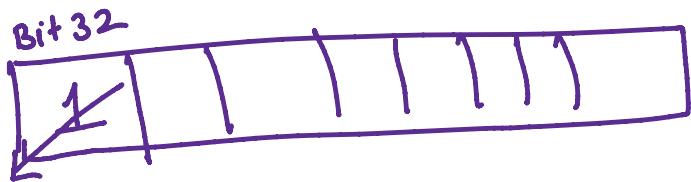
Int  $\rightarrow$  4 Bytes

32 bits



$$\underline{x} \quad \underline{y} \quad \underline{z}$$

$$\frac{x}{N} \quad \frac{y}{N}$$



$$N = 7$$

$$N \gg 1$$

$$\begin{matrix} N \gg 2 \\ N \gg 3 \end{matrix}$$

$$\begin{matrix} 1 & 1 & + \\ 0 & 1 & + \end{matrix} \rightarrow 3$$

$$\begin{matrix} 0 & 0 & 1 \\ 0 & 0 & 0 \end{matrix} \rightarrow \begin{matrix} 1 \\ 0 \end{matrix}$$

$$N \gg 1$$

$$\frac{N}{2}$$

$$N \gg 2$$

$$\frac{N}{2 \times 2}$$

$$N \gg 3$$

$$\frac{N}{2 \times 2 \times 2}$$

$$N \gg k$$

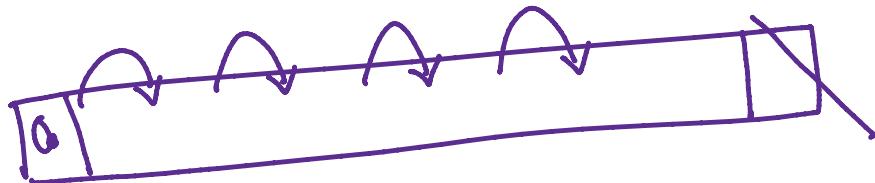
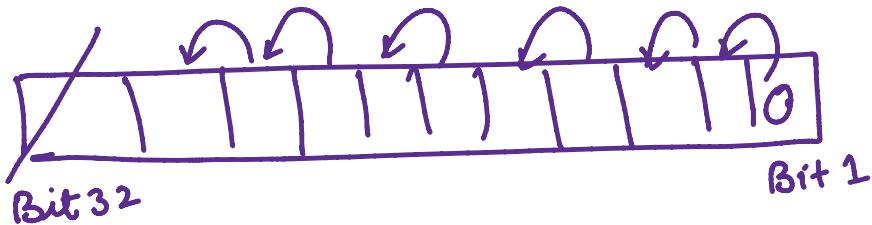
$$\frac{N}{2 \times 2 \times 2 \times \dots \times k \text{ times}}$$

$$\left\lfloor \frac{N}{2^k} \right\rfloor$$

$$\lfloor \cdot \rfloor = \text{floor}$$

$$N = 9 \\ N > 1 \\ \left\lfloor \frac{9}{2} \right\rfloor = 4$$

Int : 32 bits



XOR

AND, OR.

## Assignment Operations

$$a = 5$$

$$\left\{ \begin{array}{l} += \\ -= \\ *= \end{array} \right.$$

$\leftarrow a = 5$

$*$  =  
 $/$  =  
 $\%$  =  
 $\&$  =  
 $\mid$  =  
 $\wedge$  =

$a + = 5$   
 $\sim a = \sim a + 5$

$b -= 2$

$c \& = 4;$   
 $c = c \& 4;$

$b = b - 2$

$\overline{\text{AND}}$   
 $\begin{array}{r} 0 \\ 0 \\ \hline 1 \end{array}$     $\begin{array}{r} 0 \\ 1 \\ \hline 0 \end{array}$   
 $\begin{array}{r} 0 \\ 1 \\ \hline 1 \end{array}$     $\begin{array}{r} 0 \\ 0 \\ \hline 1 \end{array}$   
 $\text{int } a$   
 $\text{int } b$

$$\begin{array}{r}
 5: \quad \begin{array}{r} 1 & 0 \\ 0 & 1 \\ \hline 1 \end{array} \\
 3: \quad \begin{array}{r} 0 \\ 1 \\ \hline 1 \end{array} \\
 \hline
 \end{array}
 \xrightarrow{1}$$

$\underline{\text{int }} b = 5;$   
**(b)**

## Math

$$\pi = \frac{22}{7} = 3.142\ldots$$

M\_PI

functions:

① min

min (a, b)

$$\left. \begin{array}{l} d = \underline{\min (a, b)} \\ \text{ans.} = \min (c, d) \end{array} \right\}$$

min (min (a, b), c)

② max ( , )

$$2 \times 2 \times 2 = 8$$

③ sqrt ( )      Square Root

④ cbrt ( )      Cube Root

$$\sqrt[3]{}$$

⑤ Absolute value:      Positive value.

$$5 \rightarrow 5$$


 value  
 ignoring the sign       $\text{abs}()$

⑥ Power of a number       $a^b$  :  $\text{pow}(a, b)$

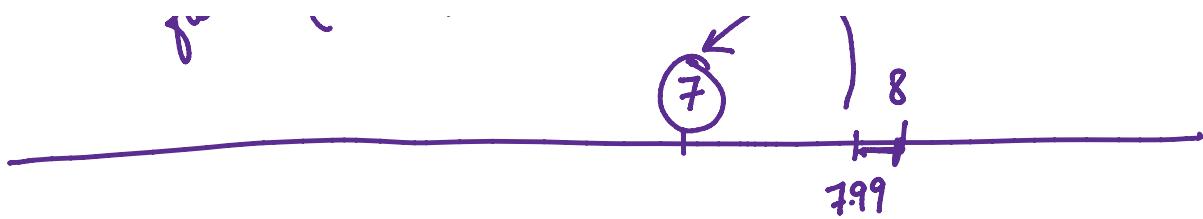
$$2^3 : \text{pow}(2, 3) = 8$$

$$2^0 = 1 \quad \text{pow}(4, 0) \rightarrow 1$$

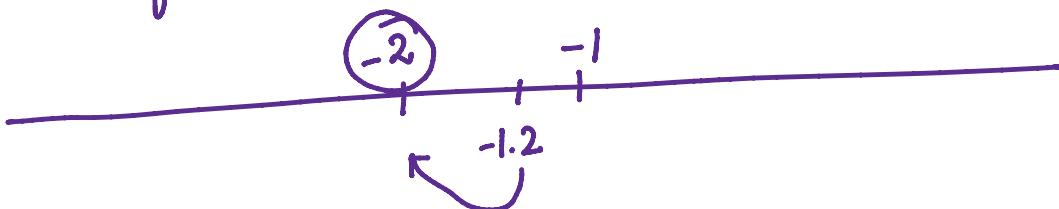
$$2^{-1} = \left(\frac{1}{2}\right)^1 \quad \text{pow}(2, -1) \rightarrow 0.5$$

⑦ floor function : Integer value  $\leq 2$

$$\begin{array}{ccc}
 7 & & 7 \\
 \text{floor}(8.3) & \rightarrow 8 & . \\
 \text{floor}(7.99) & \rightarrow 7 & \\
 & & \swarrow \curvearrowleft 8
 \end{array}$$



$$\text{floor}(-1.2) = -2$$



⑧ Ceil function : Integer  $\geq$  Number

$$5 \rightarrow 5$$

$$-2 \rightarrow -2$$

$$8.001 \rightarrow 9$$

$$8.9 \rightarrow 9$$

$$-1.5 \rightarrow -1$$

{  
 sin  
 cos  
 tan  
 log  
 e

$\times$

Sequence of characters

" . . . "

String:

String:

string s = "Hello";

string s;  
cin >> s;

```
#include<iostream> //Header File
#include<string.h> //Library containing string functions
using namespace std;
int main(){ //Start of the main function
    /* string s;
    // cin>>s; //Stops on seeing a space
    getline(cin,s); //Stops on seeing an ENTER
    cout<<s.length(); //Number of characters present in the string */
    string s1="ABC";
    s1.push_back('D'); //Inserts 1 character at the end
    cout<<s1<<endl;
    s1.pop_back(); //Deletes the last character of the string
    cout<<s1<<endl;
    s1=s1+"EFGH"; //Add a string to another string at the end
    cout<<s1<<endl;;
    s1.append("IJK"); //Append and + are same (Concatenation)
    cout<<s1<<endl;
    s1.insert(2,"XYZ"); //Add a string at any location
    cout<<s1<<endl;
    s1.insert(1,"AAAAAAAAAAAAAAAAAAAAAAA");
    cout<<s1<<endl;
    s1.erase(30); //Delete all characters from index 30 (0 - 29 remaining)
    cout<<s1<<endl;
    s1.erase(3,15); //Delete 15 characters starting from index 3 (3-17 will be
    deleted)
    cout<<s1<<endl;
    s1.clear(); //Delete all the characters from the string
    cout<<s1<<endl;
    cout<<s1.length();
}
```

```
#include<iostream> //Header File
#include<string.h> //Library containing string functions
using namespace std;
int main(){ //Start of the main function
    string s1="Hello";
    string s2="World";
    int a = s1.compare(s2); //If the values are equal then we get 0
    cout<<a<<endl;
    string s3="hello";
    int b=s1.compare(s3);
}
```